Wound care in the ICU: Case Based Approach

October 29, 2014

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Acknowledgement to HMC Wound Care Team
Objectives

- List 3 reasons why patients with spinal cord injuries are prone to develop pressure ulcers
- Describe 4 prevention and treatment strategies for patients with pressure ulcers
- Discuss management for a patient with a neuropathic ulcer.
Case 1

32 year old male

Found down at electrical plant with burns to face, neck, abdomen, back, perineum, buttocks, bilateral upper extremities, bilateral legs.

Fall from fence
Injuries

- 39% TBSA burns
- Multiple C and T spine fractures
- R pneumothorax
- Mediastinal hematoma
- R posterior rib fractures
- Possible esophageal injury
Wound Care Consult
3 Weeks After Admission

RN: “Skin breakdown in sacrococcygeal area”

At the time of the consult, has spinal cord injury, paraplegic with little movement upper arms, mafenide soaks for recent grafts, incontinent of stool.
6cm x 2cm area of skin breakdown on sacrum extending to coccyx. 75% of the wound base is blanching moist red tissue and 25% is purple nonblanching tissue in the coccyx area.
What is this?

Etiology is consistent with moisture associated dermatitis with an area of suspected deep tissue injury near his coccyx.
Moisture Associated Skin Damage
Intertrigo
Periwound Maceration
Incontinence Associated Dermatitis
Suspected Deep Tissue Injury

Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.*

*NPUAP, 2009
Treatment Recommendations

- Low air loss bed
- Wicking pads
- Skin barrier protection using sealants or creams
- Monitor suspected deep injury for progressing induration, developing area of fluctuance, increased depth & size of bed, or undermining/tunneling structures
- Turning every 2 hours while in bed, every 1 hour while up in chair
- Turning and repositioning equipment
Size: 4cm x 4cm x 0.3cm. Wound base is 50% moist red viable tissue and 50% yellow slough. There is also an area of nonblanching purple tissue at 2 o'clock consistent with a suspected deep tissue injury.
Etiology?

Etiology is consistent with an unstageable pressure ulcer mixed with moisture associated dermatitis.

No change in treatment recommendations.
Unstageable Pressure Ulcers

Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.
Evolution of a Wound

8/8/2014

8/22/2014

8/28/2014
Unstageable Pressure Ulcer

9/4/2014

9/11/2014
Change in Treatment Plan

Goal: Remove necrotic tissue

Continue other recommendations for pressure reduction, turning device, wicking underpads, and periwound protection

8/13: Change to dressing: medihoney gel on gauze, change daily.

8/22: Change to medihoney alginate covered with foam dressing, change every 3 days

8/28: Change to medihoney HCS, change every 3 days
Surgical Debridement 9/12

Size: 9 cm X 7 cm X 2 cm

The wound base is now 60% moist red granulation tissue and muscle and 40% yellow fascia. 1cm undermining is present from 9-11 o'clock.

Treatment: Negative pressure wound therapy.

Etiology now consistent with Stage IV Pressure Ulcer
Stage IV Pressure Ulcers

Full thickness tissue loss with exposed bone, tendon, cartilage, or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.
The wound base is 90% moist red granulation tissue and 10% white fascia and bone.
Osteomyelitis?

What is it? Inflammation of bone by infected organism

Once bone exposure in wound, there is risk of osteomyelitis

Diagnosis: bone biopsy (gold standard), X-ray, MRI

Labs: CBC, ESR, CRP, Blood cultures

Treatment: 4-6 weeks antibiotics
Case 1

Fever, ↑ ESR and CRP, full body sweats, one out of 4 + blood cultures

ID consulted for possible osteo: Wound not active infected. Stable without signs of active osteo.

Continue negative pressure wound therapy

Possible flap surgery in the future.
Wound Treatments Used

- Skin Sealants
- Topical Debridement
- Negative Pressure Wound Therapy
Skin Sealants

- Transparent barrier for vulnerable skin. Assists in protection from moisture, chemical (urine/feces), and mechanical forces.

Examples:

- No Sting Barrier (Cavilon, 3M)
- No Sting Skin Prep (Smith & Nephew)

Allow to dry 30 seconds.
Skin Sealants

Indications: Protect skin from moisture, mechanical, and chemical threats. Use under tapes to prevent denudement with removal.

Usage: Up to twice a day with Cavilon product more frequently with other products. See recommendations.
Topical Debriders

Examples:
- Santyl (Collagenase)
- Mesalt
- Medihoney
Examples:
- Wound V.A.C.
- Engenex
- Renasys
- SNaP
Negative Pressure Therapy

Promotes granulation tissue formation & removes exudate.

Indications: Both acute and chronic wounds.

Usage: Dressing changes every 48 to 72 hours. Must have provider’s order. Strict guidelines around this medical device.
Precautions

Do not use if necrotic tissue.

Do not use with active bleeding & clotting disorders.

Use with caution with elevated INRs and those on anticoagulants.

Cannot be used with untreated infections, including osteomyelitis.

Never hook tubing to wall suction.

Know FDA regulations regarding use of this device.
Negative Wound Therapy

Advantages:

- Controls fluid/exudate and wound is isolated while dressing is intact (protected from stool, environmental burdens, etc.).

- Negative pressure provides contraction which promotes wound closure.
Who is at Most Risk for Pressure Ulcer Development?

- Older patients > 65 years old
- Pediatrics—related to use of equipment and devices
- Spinal cord injured patients
- Obese
- Underweight
- Patients at end of life
- Critical care patients

Immobility is the most significant risk factor for PU development.
Pressure Ulcers and Spinal Cord Injuries

Up to 30% new SCI patients will develop pressure ulcers

Changes below the level of injury

- Neuropathy
- Lower blood pressure \(\rightarrow\) decreased perfusion
- Decrease in reactive hyperemia
  - Abnormal resting blood flow
  - Decreased O2 and nutrient delivery
- Loss of calf muscle pump
  - Increase venous and lymphatic pressures
SCI and Pressure Ulcer Development

- Loss of muscle mass
- Loss of fat pad
- Contractures
- Moisture and maceration
  - Incontinence
  - Perspiration
- Dependent edema
- Altered immune response → decrease inflammatory cascade

Pressure Ulcers in Spinal Cord Injury, National Pressure Ulcer Advisory Panel, 2014
Pressure Ulcers and Spinal Cord Injury

Pressure ulcers can develop in unusual locations.

For Example:
- Lateral foot, inversion contractures
- Head of fibula
- Lesser trochanter

Pressure Ulcers in Spinal Cord Injury, National Pressure Ulcer Advisory Panel, 2014
Minimize pressure, friction, and shear.

Clean, dry, and moisturize skin w/ incontinence.

Maintain HOB at or below 30° if possible.

Use turning or lift sheets or devices to turn or transfer.

Raise knees before putting HOB up to decrease shear.

Avoid massage over bony prominences.

Turn/reposition every 2 hours if in bed, if chair bound every hour.
Prevention

No donuts.
Float heels.
Bowel/bladder program (consider urinary or rectal foley if appropriate).
Skin barriers to maintain skin integrity
Adequate nutrition.
Educate Pt’s and caregivers.
Continue w/ preventive measures even if Pt has a pressure ulcer.
Reduce friction and shear.

Turn/reposition Q 2 or Q1 if in chair, Q15 min if in WC.

HOB <30.

Pressure redistribution and other specialized mattresses

Manage fecal and urinary incontinence. Reduce diaper use. Wicking under pads.

Adequate nutrition/fluid (involve dietary).

Pressure mapping if available.

Cleanse wound at each dressing. Debride necrotic tissue (CWCN, NP, PA, MD).

DO NOT debride dry stable eschar on heels.

Experiencing Déjà vu? Yes, treatment is very similar to prevention.
What Can You Do?

Examine all aspects of your patient’s skin within the first 24 hours. Don’t forget the occiput and heels! Be especially vigilant in checking the skin of patients with spinal cord injuries.

Document findings in the medical record.

Follow hospital policy if you find or suspect a pressure ulcer has developed while at the hospital.

Ask for help from the certified wound nurses at your hospital.
Suspected deep tissue injuries can evolve into much deeper wounds.

Treatment usually involves a multidisciplinary approach.

Patients with spinal cord injuries have higher risk to develop pressure ulcers.

Skin checks within 24 hours, including documentation, is very important!
47 year old male

HX of cirrhosis

Sister asked for welfare check

Patient found down amid feces and empty champagne bottles.

Initially responsive to name but non-verbal

Covered in feces and with R foot in black plastic bag. When bag was removed, darkened skin with wound infested with maggots was revealed.
ED Presentation

- Altered mental status
- Tachycardia
- Hypothermic
- Elevated lactate
- Infected R foot wound
- Leukocytosis
Met SIRS/Sepsis Criteria

- Admitted to ICU
- Fluid resuscitation
- Antibiotics
- Intubated
- Ortho Consult
- Wound Consult
ICU: 24 Hours After Admission: R Foot
Wound/Limb Preservation Consult

Noted elevated ESR 98 and CRP 205.8

R foot deformity consistent with a Charcot foot 2/2 Lower Extremity Neuropathic Disease (LEND).

No signs or symptoms of pain with wound assessment and treatment

Unable to perform Semmes-Weinstein monofilament testing 2/2 AMS.

Unable to palpable pulses. Audible Doppler pulses: Left DP & PT both Biphasic. Right DP (monophasic), Right PT (biphasic).
Recommendations

- Orthopedic surgery to evaluate for viability of foot and possible amputation
- Dressing recommendations: Dakin's solution on roll gauze to decrease the bioburden and assist with killing any remaining maggots retained in the undermining aspect of wound.
- Offloading boots for the heels.
Case 2

- Within 24 hours, received R below knee amputation
- Began to clear mentally
- Eventually transferred to acute care floor
Neuropathy

Many causes, most common diabetes.

Can also be caused by trauma, kidney disease, some cancer treatment, vitamin deficiencies (esp. Vit B12 and folate), autoimmune diseases (i.e. lupus and rheumatoid arthritis, alcohol, syphilis, and many others…)

For this case:

“Peripheral neuropathy complicated by Charcot joint: etiology of peripheral neuropathy likely due to alcohol consumption. EMG performed in the past showing mixed sensory and motor polyneuropathy, no history of DM. HbA1c within normal limits of 5%.”
Six Days Later: New Wound Care Consult

Called back several days later to assess L foot

Dried wound beds

Full thickness wounds, probe to bone
L Heel

Deroofed Bullae
L Foot Assessment

Pt unable to give an accurate history of multiple wounds on his L foot. Wounds on dorsal and plantar foot.

Slight pedal edema

DP and PT pulses confirmed with doppler.

Loss of protective sensation foot and leg when checked by Semmes-Weinstein monofilament test.

No pain with any wound assessment or treatment.
L Foot Recommendations

All dried L foot wounds-
--Paint with betadine daily and allow to dry

L foot: 2nd, 3rd and 4th toe wounds (open/draining)
- Dakins on gauze

L heel:
- Apply bordered foam dressing

- Recommend continuing offloading boot

- Ortho evaluate the L foot
- ABIs of the foot to assess for arterial flow.
- Follow up with podiatry as an outpatient.
- Plain films of the foot to assess for gas and/or osteomyelitis.
- PT/OT consult

- Prosthetics and Orthotic Consult to assess foot wear.
Why Different Recommendations for L Foot Wounds?

- Dry stable wounds when arterial function unknown, keep the wounds dry. Betadine helps decrease bacterial load.
- Open draining infected wounds, Dakin's is used to decrease bioburden and keep the wound bed moist.
- Heel: Dressing applied since the wound is open and no longer stable.
Neuropathic Wounds

- Neuropathy with loss of protective sensation
  - Monofilament test
- Vascular compromise
- Pain: neuropathic burning, tingling, shooting
- Musculoskeletal deformities
- Skin and nail changes
  - Loss of sweating and oil production
  - Callus formation
  - Thickened nails
Semmes-Weinstein Monofilament Exam: Sensory Neuropathy

- Have pt close their eyes.
- Apply monofilament perpendicular to the skin’s surface. Apply sufficient force to cause the filament to buckle/bend. Use smooth, not jabbing, motion.
- Total duration of the approach, skin contact, and departure of filament from each site should be approximately 1-2 seconds.
- Apply filament along margin of callus, ulcer, scar, or necrotic tissue.
Semmes-Weinstein Monofilament Exam

- Passing score 7/10 or greater
- Failed monofilament testing indicated **loss of protective sensation**
Hammer & Claw toe
Charcot Foot
Ulcer Characteristics

- Over a pressure point
- Usually painless. If have pain, not usually a good sign if also has loss of protective sensation.
- May probe to bone
- Periwound with callous
Management

- Treatment of infection
- Assess for arterial insufficiency
- Offload the wound
- Debridement
- Referral to podiatry
- May need urgent surgical referral
- Diabetic? Glycemic control
- Daily foot and shoe inspection
Requires Surgical Referral
Pearls from Case 2

- Maggot infestation
  - Copious irrigation (wear protective gear)
  - Consider Dakins or other antimicrobial to decrease bioburden
  - Dispose in biohazard bag.
- Will likely need multiple referrals to other disciplines for management
- Assessment of arterial perfusion
- Will need follow up with podiatrist specializing in neuropathic ulcers as outpatient
Questions????

Thank you